To ensure that this manual is kept up to date and that a record of amendments to this manual is available, an Amendment Instruction Sheet will be issued with each set of revised pages.

- The Title page of the Manual is re-issued, and the Part No. has been raised to the next edition. Except for the Contents pages, all revised and new pages have the issue date at the foot of each page, together with an indication of whether the pages are revised or new.
- This Amendment Instruction Sheet must be inserted at the front of the manual to indicate that the amendment has been incorporated. Do not discard previous Amendment Instruction sheets.
- Your manual is only complete to this issue providing all prior Amendments are included.
- The filing instructions give section and page numbers affected. Additional pages or complete new sections may be issued, insert the pages as instructed.

### FILING INSTRUCTIONS

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This gearbox is fitted to the following models:-

Rover 218/418 Diesel
New Rover 200 Diesel
New Rover 218
New Rover 400 Diesel
Rover 220
Rover 420
Rover 600 Diesel
Rover 600 Ti
Rover 820
Rover 800 KV6
MG-F
How to use this manual

To assist in the use of this manual the section title is given at the top and the relevant sub-section is given at the bottom of each page.

This manual contains procedures for the overhaul of the gearbox on the bench with the engine removed. For all other information regarding General Information, Adjustments, Removal of oil seals, gearbox unit, consult the Repair Manual for the model concerned.

This manual is divided into 3 sections, Description and Operation, Overhaul and Data, Torque & Tools. To assist filing of revised information each sub-section is numbered from page 1.

The individual overhaul items are to be followed in the sequence in which they appear. Items numbered in the illustrations are referred to in the text.

Overhaul operations include reference to Service Tool numbers and the associated illustration depicts the tool. Where usage is not obvious the tool is shown in use. Operations also include reference to wear limits, relevant data, torque figures, and specialist information and useful assembly details.

WARNINGS, CAUTIONS and Notes have the following meanings:

**WARNING:** Procedures which must be followed precisely to avoid the possibility of injury.

**CAUTION:** Calls attention to procedures which must be followed to avoid damage to components.

**NOTE:** Gives helpful information.

References

With the engine and gearbox assembly removed, the crankshaft pulley end of the engine is referred to as the front.

Operations covered in this manual do not include reference to testing the vehicle after repair. It is essential that work is inspected and tested after completion and if necessary a road test of the vehicle is carried out particularly where safety related items are concerned.

Dimensions

The dimensions quoted are to design engineering specification with Service limits where applicable.

REPAIRS AND REPLACEMENTS

When replacement parts are required it is essential that only Rover recommended parts are used.

Attention is particularly drawn to the following points concerning repairs and the fitting of replacement parts and accessories.

Safety features and corrosion prevention treatments embodied in the car may be impaired if other than Rover recommended parts are fitted. In certain territories, legislation prohibits the fitting of parts not to the manufacturer’s specification.

Torque wrench setting figures given in this Manual must be used. Locking devices, where specified, must be fitted. If the efficiency of a locking device is impaired during removal it must be renewed.

The Terms of the vehicle Warranty may be invalidated by the fitting of other than Rover recommended parts. All Rover recommended parts have the full backing of the vehicle Warranty.

Rover Dealers are obliged to supply only Rover recommended parts.
INTRODUCTION

SPECIFICATION

Rover are constantly seeking to improve the specification, design and production of their vehicles and alterations take place accordingly. While every effort has been made to ensure the accuracy of this Manual, it should not be regarded as an infallible guide to current specifications of any particular component or vehicle.

This Manual does not constitute an offer for sale of any particular component or vehicle. Rover Dealers are not agents of Rover and have no authority to bind the manufacturer by any expressed or implied undertaking or representation.

Gearbox identification

This overhaul manual is applicable to PG1 gearboxes having the following Serial No. prefixes:

| C4BP | R4A0  |
| C4BS | R4DT  |
| C6BN | S4DTU |
| C6BP | S4EM  |
| C6BS | S4FTU |
| S6BSU| S6AO  |
| C6DTUT| S6BN |
| C6DTUTH| S6BNU|
| C6DUTH| S6BS  |
| C6FTUT | S7EMU |
| K4BS | V4DT  |
| K4BX | V6BS  |
| K6AO | W4BS  |
| K6BN | W4DTU |
| K6BS | Y4AO  |
| K7BSUT|      |
| K7BX |      |
| M5BS |      |
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### GEARBOX COMPONENTS

| 1.  | Oil seal - differential |
| 2.  | Differential housing     |
| 3.  | Speedometer drive pinion and housing |
| 4.  | Dowel                   |
| 5.  | Oil seal - selector shaft |
| 6.  | Boot                    |
| 7.  | Selector shaft          |
| 8.  | Thrust washer - sun gear |
| 9.  | Sun gear                |
| 10. | Thrust washer - planet gear |
| 11. | Planet gear             |
| 12. | Pinion shaft            |
| 13. | Ball bearing - differential |
| 14. | Final drive gear        |
| 15. | Roll pin - differential pinion shaft |
| 16. | Speedometer drive gear  |
| 17. | Differential casing     |
| 18. | Ball bearing - differential |
| 19. | Selective shim          |
| 20. | Clutch release shaft    |
| 21. | Oil seal - clutch release shaft |
| 22. | Selector shaft guide    |
| 23. | Dowel bolt and washer   |
| 24. | Magnet                  |
| 25. | Detent cap bolt, ball and spring - selector shaft |
| 26. | Oil guide plate         |
| 27. | Parallel roller bearing - output shaft |
| 28. | Output shaft            |
| 29. | Selective thrust washer - 1st gear end float |
| 30. | Needle roller bearing - 1st gear |
| 31. | 1st gear                |
| 32. | Synchro ring - 1st gear |
| 33. | Synchro spring          |
| 34. | Synchro hub - 1st/2nd gear |
| 35. | Synchro sleeve - 1st/2nd gear |
| 36. | Synchro spring          |
| 37. | Synchro ring - 2nd gear |
| 38. | Selective collar - 2nd gear end float |
| 39. | Needle roller bearing - 2nd gear |
| 40. | 2nd gear                |
| 41. | 3rd gear                |
| 42. | 4th gear                |
| 43. | 5th gear                |
| 44. | Ball bearing - output shaft |
| 45. | Ball bearing - output shaft |
| 46. | Tongued washer          |
| 47. | Output shaft nut - L.H. thread |
| 48. | Circlip                 |
| 49. | Reverse idler shaft     |
| 50. | Thrust washer - reverse idler gear |
| 51. | Roll pin - reverse idler shaft |
| 52. | Reverse idler gear      |
| 53. | Reverse selector fork   |
| 54. | Oil seal - input shaft  |
| 55. | Ball bearing - input shaft |
| 56. | Input shaft             |
| 57. | Needle roller bearing - 3rd gear |
| 58. | 3rd gear                |
| 59. | Synchro ring - 3rd gear |
| 60. | Synchro spring          |
| 61. | Synchro hub - 3rd/4th gears |
| 62. | Synchro sleeve - 3rd/4th gears |
| 63. | Synchro spring          |
| 64. | Synchro ring - 4th gear |
| 65. | 4th gear                |
| 66. | Needle roller bearing - 4th gear |
| 67. | Distance collar - 4th/5th gears |
| 68. | Needle bearing - 5th gear |
| 69. | 5th gear                |
| 70. | Synchro ring - 5th gear |
| 71. | Synchro spring - 5th gear |
| 72. | Synchro hub - 5th gear  |
| 73. | Synchro sleeve - 5th gear |
| 74. | Ball bearing - input shaft |
| 75. | Selective snap rings - input shaft end thrust |
| 76. | Belleville washer - input shaft end thrust |
| 77. | Oil guide plate         |
| 78. | Gearbox casing          |
| 79. | Reverse idler shaft bolt and washer |
| 80. | Breather pipe           |
| 81. | Breather pipe bracket   |
| 82. | Oil seal - differential |
| 83. | Filler/level plug       |
| 84. | Drain plug              |
| 85. | Access plug - output shaft bearing circlip |
| 86. | Reverse light switch    |
| 87. | Interlock assembly - early gearboxes |
| 88. | Gearshift holder        |
| 89. | Gearshift arm guide     |
| 90. | Shift shaft             |
| 91. | Roll pin - 5th/reverse gear selector |
| 92. | Gear selector - 5th/reverse gears |
| 93. | Selector fork - 3rd/4th gears |
| 94. | Selector fork - 5th gear |
| 95. | Selector shaft - 5th/reverse gears |
| 96. | Selector fork - 1st/2nd gears |
| 97. | Selector shaft - 1st/2nd gears |
| 98. | Bearing - roller **     |
| 99. | Bearing - ball **       |
| 100.| Retainer plate - output shaft bearing ** |
| 101.| Retainer plate bolts - Patchlok ** |
| 102.| Clutch release shaft bush - inner |
| 103.| Clutch release shaft bush - outer |
| 104.| Interlock assembly - later gearboxes |
| 105.| Gear selector - 5th/reverse gears/with reverse brake* |
| 106.| Spring - reverse brake* |
| 107.| Lock plate - reverse brake* |
| 108.| Taptite screws - reverse brake* |

* Gearboxes with reverse brake fitted

** Fitted to gearboxes having the letter U in the gearbox serial number prefix
### SECTIONED VIEW OF GEARBOX

1. Oil guide plate  
2. Input shaft assembly  
3. Gear case  
4. Reverse idler shaft bolt  
5. Reverse idler gear  
6. Breather pipe and bracket  
7. Differential housing  
8. Access plug - output shaft bearing circlip  
9. Output shaft assembly  
10. Shift arm assembly and interlock  
11. Selective shim  
12. Final drive assembly  
13. Speedometer drive pinion housing  
14. Selector shaft  
15. Oil drain plug  
16. Oil filler/level plug
MANUAL GEARBOX

DESCRIPTION

The 5 speed constant mesh gearbox employs single helical gears for speed transmission and final drive. The input shaft carries the primary input gear, reverse pinion, 2nd gear and 3rd, 4th and 5th gear synchromesh hubs and idler gears. It is supported by two ball races. End float is controlled by selective circlips and a Belleville washer. Its short input end eliminates the need for support in the engine crankshaft. The output shaft carries the final drive pinion, 1st idler gear, 1st and 2nd synchromesh hubs, 2nd speed idler gears and 3rd, 4th and 5th gears. The shaft is supported in the differential housing by a parallel roller bearing and depending on application, is supported in the gearcase by either a double ballrace or a single ballrace and roller bearing. Pinion location is controlled by a selective washer. The rear end of the shaft is secured by a circlip which retains the bearings in the gear case. Synchromesh is by spring rings and spline extensions in the inner faces of the synchromesh sleeves. Gear selection is via an interlock and gearshift holder assembly which transmits movement of the main selector shaft to the selector forks. Later specification gearboxes employ a reverse brake mechanism. Lubrication is by splash. An oil gutter located on the upper side of the gear case collects splashed oil and directs it to oil guide plates which distribute it to the hollow input and output shafts.

DESCRIPTION - TORSEN DIFFERENTIAL

Gearboxes fitted to certain models incorporate a 'Torsen' limited slip differential. The word 'Torsen' is derived from torque sensing which describes the principle of operation.

Two types of differential are fitted, type A is fitted to gearboxes having serial number prefixes K4BX and K7BSUT. Type B is fitted to gearboxes having serial number prefixes C6FTUT; W4DTUT; C6DTUT and C6DTUTH.

Type A

The assembly comprises a final drive gear bolted to the differential casing; two helical gears splined to the drive shafts and three pairs of element gear assemblies arranged at 120° intervals within the differential casing and running at right angles to the helical gears. Each of the element gear assemblies comprises a worm gear and two spur gears running on a journal pin. The worm gears are in constant mesh with the helical gears and the spur gears mesh with those of the adjoining element gear assembly. Axial thrust of the helical gears is controlled by a combination of thrust washers and needle roller bearings located at each end of and between the two gears.

Type B

The assembly comprises a final drive gear bolted to the differential casing two helical side gears splined to the drive shafts and four pairs of element gear assemblies arranged at ninety degree intervals within the differential casing and running parallel to the side gears. Each of the element gear assemblies comprises two helical gears of unequal length, the long gears are in constant mesh with the helical side gears splined to the drive shafts and also with the short gears of the adjoining element. Axial thrust of the helical side gears is controlled by thrust washers located between the end of each gear and the differential casing and by a thrust washer and friction washer located between the two gears.

OPERATION

With the exception of reverse all gears are in constant mesh. Forward ratios are obtained by locking a gear to its shaft using its individual synchronizer hub and sleeve. Reverse gear is obtained by engaging reverse idler gear with the reverse gears changing the direction of rotation of the output shaft. When a forward gear is selected the synchronizer sleeve presses the synchromesh female cone into contact with a corresponding male cone in the gear chosen. This synchronizes the speeds of the synchronizer hub and gear. The synchronizer sleeve then engages the gear and by means of a spring ring, teeth extensions on the synchronizer sleeve and detents in the selector shaft holds the selected gear in engagement. Torque is transmitted from the input shaft through the selected gear to the output shaft pinion and final drive gear to the drive shafts.
Torsen differential - Type A - Serial number prefixes K4BX and K7BSUT

1. Helical side gear
2. Element gear assembly - worm and spur gears
3. Journal pin
4. Thrust washer and spacing washer
5. Two thrust washers and needle roller bearing
Torsen differential - Type B - Serial number prefixes C6FTUT; W4DTUT; C6DTUT and C6DTUTH

1. Helical side gear
2. Element gear assembly - helical gears
3. Friction washers
4. Thrust washers

Unlike a conventional limited slip differential, the torque sensing differential does not rely on the locking value of friction discs but by the friction produced by the teeth of the two helical side gears splined to the drive shafts meshing with the gears of the element gear assemblies. On Type A differentials, additional locking values are generated by the thrust washers and needle roller bearings located at each end of and between the side gears; whilst on Type B differentials, a combination of thrust washers and friction washers is used.

When both front wheel speeds are equal, then the frictional loads imposed by the element gears on the side gears are also equal. However, when the drive resistance on a road wheel is reduced through loss of traction then a torque imbalance is created; less torque being required to turn the wheel with the highest speed. This torque imbalance is sensed by the differential and results in a lowering of the friction imposed by the element gears on the side gear driving that particular wheel. This causes a reduction in wheel speed until a point is reached where traction is restored, the torque required to turn both wheels is equal and both wheels are rotating at the same speed.
A reverse brake mechanism has been introduced to the PG-1 gearbox, and is operated by the selector fork mechanism, which stops the input shaft from rotating prior to the engagement of reverse gear and provides a quiet and smooth engagement of reverse gear, providing the vehicle is stationary.

The reverse brake utilizes the 3rd/4th synchro hub for its operation. The 5th/reverse shift piece, which is secured to the selector shaft by a roll pin, and incorporates two guide lugs with two machined grooves that form a platform for a lock plate. The inner face of the lock plate is angled approximately at 45°, with two machined flanges either side of the lock plate which are positioned in machined grooves in the guide lugs. A return spring, which biases the lock plate against the stop surface, extends along the step at the front of the lock plate, with the two free ends of the spring held in position by two ‘Taptite’ screws either side of the shift piece. A lug on the 3rd/4th selector fork has a machined face at an angle of 45° which acts as a ramp when in contact with the angled face of the lock plate. 1st/2nd selector shaft has a machined abutment surface located below the detent grooves, the abutment surface being the area of contact for the lock plate.
When selecting reverse gear, the 5th/reverse shift piece (1) moves upwards, and the angled face of the lock plate (3) contacts the ramp of 3rd/4th selector fork (2). The upward movement carries the lock plate (3) outwards until it contacts the abutment (4) on 1st/2nd selector shaft. From this point, continued upward movement of the 5th/reverse shift piece (1) causes the lock plate (3) to move the 3rd/4th selector and synchro sleeve (5) towards 4th gear. The movement of the 3rd/4th synchro sleeve (5) is sufficient to restrain the input shaft (6), thus permitting smooth engagement of reverse gear.

To prevent any further movement of the 3rd/4th synchro sleeve (5) and engagement of 4th gear, the spring on the lock plate (3) moves the lock plate into the machined groove (7) above the abutment (4).
GEARBOX DISMANTLING

1. Thoroughly clean exterior of gearbox.

2. Remove reverse light switch; discard sealing washer.

3. Remove bolt and locating plate securing speedometer drive pinion and housing.

4. Remove speedometer drive pinion and housing, discard ‘O’ ring.

5. Remove access plug using tool 18G 1472.

7. Remove bolt retaining reverse idler shaft, discard washer.
8. Noting their fitted position, remove 14 bolts securing gear case to differential housing; release breather pipe bracket.
9. Using a soft-faced mallet, release gear case from differential housing; remove gear case.
10. Remove and discard output shaft bearing circlip from gear case.
11. Remove selective circlip from differential bearing recess in gear case; retain circlip.
12. Remove differential oil seal.
   **CAUTION:** Two types of oil seal have been fitted, retain oil seal for reference to ensure that replacement is of correct type.
13. Remove selective circlip(s).
14. Remove and discard Belleville washer.
15. Remove input shaft oil guide plate.
16. Using feeler gauges, measure clearance between reverse idler gear and selector fork.
   Clearance = 0.5 to 1.1 mm

17. If clearance obtained exceeds above figure, measure width across prongs of selector fork.
   Prong width = 13.0 to 13.3 mm.

18. Using feeler gauges, measure clearance between pin and selector fork groove.
   Standard = 0.05 to 0.35 mm
   Service limit = 0.5 mm

19. If clearance obtained exceeds service limit, measure width of selector fork groove.
   Groove width = 7.05 to 7.25 mm

CAUTION: If dimensions obtained exceed figures given, selector fork must be replaced.

20. Remove reverse idler gear, thrust washer and idler shaft.
21. Remove 2 bolts securing reverse selector fork bracket; remove bracket and fork.
22. Using feeler gauges, measure clearance between gearshift arm and guide.
   Standard = 0.2 to 0.3 mm
   Service limit = 0.55 mm

23. If clearance obtained exceeds service limit, measure width of groove in guide.
    Groove width = 8.1 to 8.2 mm

   CAUTION: If dimensions obtained exceed figures given, interlock assembly must be replaced.

   NOTE: Latest type interlock assembly illustrated

24. Noting their fitted position, remove 3 bolts and retaining interlock assembly; remove assembly.

25. Raise both input and output shafts slightly, remove selector forks and rails.

26. Using 2 suitable levers, remove input shaft bearing.
27. Move synchro sleeve to engage 1st and 4th gears.

CAUTION: Damage to components will result if gears other than 1st and 4th are engaged.

28. Position tool 18G 1473 on input shaft and around output shaft bearing.
29. Release staking, remove and discard nut from output shaft.

NOTE: Nut has a LH thread.

30. Remove and discard tongued washer.
31. Remove tool 18G 1473.
32. Remove input and output shafts from differential housing.

33. Lift differential assembly out of housing.

NOTE: Standard differential illustrated.

34. Remove differential oil seal.

CAUTION: Two types of oil seal have been fitted, retain oil seal for reference to ensure that replacement is of the correct type.
35. Using a soft metal drift, remove input shaft bearing from differential housing; discard bearing.
36. Remove and discard input shaft oil seal.

38. Remove output shaft bearing using tools 18G 284 and 18G 284-14, discard bearing.
39. Remove output shaft oil guide plate.

37. Remove and discard 2 Patchlok bolts securing output shaft bearing retaining plate - if fitted; remove plate.
40. Remove detent cap bolt and washer, recover detent spring and ball.

**NOTE:** Use a stick magnet to recover ball.

41. Remove bolt and washer securing selector shaft guide to shaft.
42. Withdraw selector shaft; remove selector shaft guide.
43. Remove gaiter from shaft.
44. Remove and discard oil seal.

45. Remove bolt and washer securing clutch release fork to release shaft.
46. Withdraw release shaft.
47. Remove and discard release shaft oil seal.
CAUTION: Keep component parts of each synchro assembly together.

Input Shaft

1. Remove 5th gear synchro assembly.
2. Remove 5th gear and needle bearing.
3. Remove 4th gear together with collar and needle bearing.
5. Remove 3rd gear and needle bearing.

Output Shaft

1. Remove bearings using tool 18G 2, note type of bearing fitted; discard bearings.

NOTE: Depending on the application, either a double ballrace or single ballrace and roller bearing is fitted. Gearboxes having the letter U in the serial number prefix are all fitted with a single ballrace and roller bearing.
2. Remove 5th, 4th and 3rd gears.
3. Remove 2nd gear, needle bearing and collar.
4. Remove 1st/2nd synchro assembly.

**CAUTION:** Keep component parts of synchro assembly together.

5. Remove 1st gear and needle bearing.
6. Remove and retain selective thrust washer.

---

**Synchro assemblies**

37M1150

37M0148

**Synchro Assembly Components**

1. Synchro ring
2. Spring spring ring
3. Synchro sleeve
4. Synchro hub

**NOTE:** Only one synchro ring and spring ring are fitted to 5th speed synchro.
2. Remove 2 synchro rings.
3. Remove 2 spring rings.

**NOTE:** Only one synchro ring and spring ring are fitted to 5th synchro.

4. Remove synchro hub from sleeve.

**Synchro Assembly Identification**

1. 1st/2nd synchro
2. 3rd/4th synchro
3. 5th synchro

⚠️ **CAUTION:** Keep component parts of each synchro assembly together.

1. Suitably mark relative position of each synchro hub to its respective sleeve.
Selector Shaft Components

1. Roll pin
2. 5th/reverse gear selector
3. 3rd/4th gear selector fork
4. 5th gear selector fork
5. 5th/reverse selector shaft
6. 1st/2nd gear selector fork
7. 1st/2nd selector shaft

4. Slide 5th/reverse gear selector off 5th/reverse selector shaft.
5. Slide 3rd/4th and 5th selector forks off 5th/reverse selector shaft.

CAUTION: Two types of selector shaft assemblies have been fitted. Type A selectors are manufactured from cast steel whilst type B are manufactured from aluminium bronze and are gold in colour. Do not interchange selector forks or shafts between type A and B assemblies.

1. Identify each selector fork and its fitted position to the relevant selector shaft. Slide 1st/2nd gear selector fork off 1st/2nd selector shaft.
2. Slide 1st/2nd selector shaft out of 5th gear selector fork and 5th/reverse gear selector.
3. Using a suitable punch, remove roll pin securing 5th/reverse gear selector; discard roll pin.
5th/Reverse Selector - with reverse brake

The 5th/reverse selector (1) is secured to the selector shaft by a roll pin (2). The selector incorporates the components for the reverse brake operation. This comprises of a lock plate (3) a retaining spring (4). The spring retains the lock plate in position, with the two ends of the spring located under two ‘Taptite’ screws (5) which are positioned either side of the 5th/reverse selector.

Interlock Assembly

NOTE: A modified interlock assembly having 2 springs has been introduced; this assembly may be fitted as a replacement to early gearboxes.

1. Withdraw shift shaft from gearshift holder and arm guide.
2. Release lug on arm guide from slot in interlock.
3. Slide gearshift holder off arm guide.

Differential Assembly

1. Remove bearings using tools 18G 2, 18G 2/3 and 18G 1397; discard bearings.
2. Remove speedometer drive gear from carrier.
3. Suitably mark fitted position of final drive gear to carrier.
4. Progressively slacken, then remove 10 bolts securing final drive gear to carrier; remove gear.

**CAUTION:** With the exception of the speedometer drive gear, Torsen differentials are supplied as a complete assembly; do not dismantle.

5. Using a suitable punch, remove roll pin securing pinion shaft; discard pin.
6. Remove pinion shaft, sun gears, planet gears and thrust washers; retain thrust washers - if fitted.

**NOTE:** Selective thrust washers are fitted to planet gears, non-selective washers are fitted to sun gears.

---

**INSPECTING COMPONENTS**

1. Clean all components ensuring all traces of RTV sealant are removed from gear case, differential housing and access plug. Ensure oil drillings in input and output shafts and oil guide plates are clear. Ensure gearbox breather is unobstructed.

**CAUTION:** Do not clean plastic components with chlorinated solvent e.g. tricloroethane.

2. Check speedometer pinion for wear and pinion housing threads for damage.

**Input and Output Shaft Assemblies**

1. Check gears for worn or chipped teeth, cracks or uneven wear.
2. Check coning surfaces of gears for wear.

**CAUTION:** Gearboxes having the letter K in the Serial Number prefix: Commencing at gearbox Serial Numbers K4BS 2027303, K6BS 2018506 and K7BSUT 2002029, the helix angle of 2nd gear on both input and output shafts was changed to 33° and it is essential that if a replacement input shaft or output shaft 2nd gear is to be fitted, the correct replacement is obtained. The 33° helix gears may be fitted to gearboxes built prior to the above Serial Numbers provided that the input shaft and output shaft 2nd gear are replaced together.

3. Check needle bearings for wear and overheating (blueing).

**CAUTION:** Where any of the above are evident, all bearings on the shaft must be replaced.
MANUAL GEARBOX

4. Check shaft splines for wear and threads of output shaft for damage.
5. Check bearing collars for wear and damage.

**NOTE:** Gearboxes having the letter U in the gearbox serial number prefix are fitted with a modified output shaft assembly having an increased diameter and shot peened gears. Due to the increased diameter of the output shaft, differential housing bearing and the method of retaining the bearing, this assembly must not be fitted to any other type of gearbox.

**Synchro Assemblies**

1. Check component parts of each synchro assembly for wear or damage, ensure teeth on hubs and sleeves are not chipped or rounded off.
2. Ensure teeth on synchro rings are not chipped or damaged, check inner surfaces of rings for wear.
3. Ensure each hub moves freely in its respective sleeve.
4. Place a synchro ring on its respective gear cone and rotate it until it stops (approximately 10 to 20°).

![Diagram showing synchro assembly](37M0155)

5. Measure clearance between synchro ring and gear.
   - Ring to gear clearance:
     - Standard = 0.85 to 1.1 mm
     - Service limit = 0.4 mm (minimum clearance)
6. Repeat for remaining rings and gears.

**CAUTION:** If any ring to gear clearance is less than above service limit, synchro assembly must be replaced.

**Reverse Idler Shaft and Gear**

1. Check idler shaft for wear.
2. Check gear for wear, chipping or cracking of teeth.
3. Check needle bearings for wear, replace gear and bearings as an assembly if wear is evident.
Selector Shafts and forks

CAUTION: Type B selector shaft assembly. The selector forks fitted to the 5th/reverse selector shaft are matched to the shaft and in the event of any wear or damage, shaft and forks must be replaced as an assembly.
Do not interchange selector forks or shafts between type A and B assemblies.

1. Check shafts for wear and alignment.
2. Check selector forks for wear, cracks or damage.
3. Check the retained detent balls and springs, there must be no visible ‘flats’ on the balls and springs must keep balls in contact with the staked portion of the selector fork.

CAUTION: It is not possible to replace balls or springs, selector fork must be replaced.

6. Assemble gearshift arm guide to 3rd/4th selector fork.
7. Using feeler gauges, measure clearance between gearshift arm guide and fork.
   Standard = 0.2 to 0.5 mm
   Service limit = 0.8 mm
8. If clearance obtained exceeds service limit, measure width of tongue on gearshift arm guide.
   Standard = 11.9 to 12.0 mm

CAUTION: If width of tongue is within limits, 3rd/4th selector fork must be replaced, if width of tongue is less than quoted, gearshift arm guide must be replaced.

9. Repeat above procedures for 1st/2nd selector fork.

4. Assemble each selector fork to its respective synchro sleeve.
5. Check clearance of selector fork in synchro sleeve groove.
   Selector fork to groove clearance:
   Standard = 0.45 to 0.65 mm
   Service limit = 1.0 mm

CAUTION: If clearance is found to exceed service limit, selector fork must be replaced.
MANUAL GEARBOX

Interlock Assembly

1. Check components for wear or damage, replace assembly if necessary.

![Illustration of Interlock Assembly]

37M1166

5. Using feeler gauges, measure clearance B between interlock ball and gearshift arm guide. 
   Clearance B:
   Standard = 0.05 to 0.25 mm
   Service limit = 0.5 mm

6. If clearance exceeds service limit, measure outside diameter of interlock ball. 
   Interlock ball outside diameter = 12.05 to 12.15 mm
   CAUTION: If diameter of ball is within limits, replace gearshift arm guide, if diameter of ball is less than 12.05 mm, replace interlock assembly.

NOTE: Modified interlock assembly illustrated. This assembly may be fitted as a replacement to early gearboxes but modified interlock assemblies fitted to gearboxes having Serial Number prefixes C4BP and C6BP have uprated springs and must not be interchanged with modified interlock assemblies fitted to other gearboxes.

2. Assemble gearshift arm guide to interlock assembly.

3. Using feeler gauges, measure clearance A. 
   Clearance A:
   Standard = 0.02 to 0.3 mm
   Service limit = 0.55 mm

4. If clearance exceeds service limit, check width of groove in gearshift arm guide. 
   Groove width = 13.05 to 13.25 mm
   CAUTION: If width of groove exceeds above dimension, gearshift arm guide must be replaced. If width of groove is within service limit, replace interlock assembly.
Differential Assembly

1. Check gear teeth for wear, chipping and signs of overheating.

CAUTION: It is not possible to overhaul Torsen differentials. Replace complete assembly if any of the above are apparent.

Torsen differential

2. Check speedometer drive gear for damage, replace if necessary.

3. Remove speedometer drive gear using a suitable three legged puller and thrust button.

Standard differential

4. Check pinion shaft for wear.
5. Check speedometer drive gear teeth for wear or damage, replace as necessary.

Differential Housing

1. Check housing for damage, check that locating dowels are fitted; check clutch release shaft bushes for damage or wear and that shaft is free to turn, replace if necessary using the following procedure.

Remove

2. Outer bush: Using a hacksaw blade, carefully cut a longitudinal slot opposite the split in the bush; prise bush out of differential housing.
3. Inner bush: Carefully prise inner bush out of differential housing.
4. *Inner bush*: Using tool 18G 1723-1, drift inner bush into differential housing.

5. *Outer bush*: Using tool 18G 1723-2, drift outer bush into differential housing.

**CAUTION:** Ensure end of tool 18G 1723-2 is located in inner bush.

6. *Gearboxes fitted with output shaft bearing retainer plate*: Remove all traces of Patchlok compound from output shaft bearing retainer plate bolt holes using an M6 tap.

**CAUTION:** Ensure bolt holes are thoroughly cleaned.
COMPONENT ASSEMBLING

Differential

1. Assemble planet gears and original thrust washers.
2. Fit sun gears and original thrust washers - if fitted.
3. Rotate gears and thrust washers to align drillings in carrier.

⚠️ CAUTION: Do not fit roll pin or final drive gear at this stage.

Torsen differential

4. Position speedometer drive gear on carrier.
5. Using a suitable length of tubing, drift gear fully on to carrier.

Standard differential

![Gear Assembly Diagram]

6. Position speedometer drive gear on carrier.
7. Fit new ball bearings to carrier using tool 18G 1675.

⚠️ NOTE: Larger of the two bearings is fitted on speedometer drive gear side.

Synchro Assemblies

1. Assemble each synchro sleeve to its respective hub ensuring that raised teeth on the sleeve are aligned with the deeper grooves in hub.
2. Fit spring rings to retain hub.

⚠️ NOTE: Only one spring ring is fitted on 5th speed synchro.

3. Assemble synchro rings to their respective sleeves.

⚠️ CAUTION: When assembling the 5th gear synchro sleeve to hub, it is possible to position the raised teeth on the synchro sleeve in the machined cut-aways for the synchro ring. Although the gearbox can be assembled, it will not be possible to select 5th gear.
Selector Shafts

1. Slide 5th and 3rd/4th selector forks on to 5th/reverse selector shaft.

**CAUTION:** Ensure that longest portion of selector fork lugs face away from shoulder of shaft.

2. Slide 5th/reverse selector on to 5th/reverse selector shaft; secure selector with a new roll pin.

**NOTE:** Make sure the lock plate and retaining spring are correctly located on 5th/reverse selector fitted with reverse brake.

3. Slide 1st/2nd gear selector fork on to 1st/2nd selector shaft.
4. Locate 1st/2nd selector shaft in 5th/reverse gear selector and 5th gear selector fork.
5. Locate lug on shift arm guide in gearshift holder.
6. Position gearshift holder to interlock; fit shaft.

Reverse Idler Gear and Shaft

1. Fit a new thrust washer.
2. Smear needle bearing rollers with petroleum jelly and fit in idler gear.
3. Fit reverse idler gear to shaft.

**NOTE:** Boss on gear must face towards thrust washer.

Input Shaft

**NOTE:** Smear needle bearing rollers with petroleum jelly prior to assembly.

1. Fit needle bearing rollers in third gear.
2. Fit 3rd gear on shaft.
3. Fit 3rd/4th synchro assembly.
4. Fit needle bearing rollers in 4th gear, position gear on collar and fit assembly on shaft.
5. Fit needle bearing rollers in 5th gear, position gear on collar.

**NOTE:** Boss on 5th gear must face away from 4th gear.

6. Fit 5th synchro assembly.

**NOTE:** Machined groove in synchro hub must face towards 5th gear and large chamfer on synchro sleeve must face away from 5th gear.

7. Fit a new input shaft bearing.
Input Shaft Gear End-Float - Check

1. Position input shaft on bed of a hand press with bearing located on a suitable socket.
2. Apply downward pressure to input shaft.

NOTE: Maintain pressure whilst checks are carried out.

3. Using feeler gauges, measure clearance between 2nd and 3rd gears.
   3rd gear clearance:
   Standard = 0.06 to 0.21 mm
   Service limit = 0.3 mm

4. If clearance exceeds service limit, measure thickness of 3rd gear.
   3rd gear thickness:
   Standard = 35.42 to 35.47 mm
   Service limit = 35.30 mm

5. If 3rd gear thickness is greater than service limit, replace 3rd gear synchro assembly; if thickness is less than service limit, replace 3rd gear.

6. Using feeler gauges, measure clearance between the spacer collar and 4th gear and spacer collar and 5th gear.
   4th and 5th gear clearance:
   Standard = 0.06 to 0.21 mm
   Service limit = 0.3 mm

7. If clearance of either gear exceeds service limit measure length of appropriate side of spacer collar A or B.
   Length A = 4th gear side
   Length B = 5th gear side
   Spacer collar length A or B:
   Standard = 26.03 to 26.08 mm
   Service limit = 26.01 mm

8. If length A exceeds service limit, measure thickness of 4th gear.
   4th gear thickness:
   Standard = 30.92 to 30.97 mm
   Service limit = 30.80 mm
9. If thickness of 4th gear exceeds service limit, replace 3rd/4th synchro assembly; if thickness of gear is less than service limit, replace gear.

10. If length $B$ exceeds service limit, measure thickness of 5th gear.
    5th gear thickness:
    Standard = 30.42 to 30.47 mm
    Service limit = 30.30 mm

11. If thickness of 5th gear exceeds service limit, replace 5th synchro assembly; if thickness of gear is less than service limit, replace gear.

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Output Shaft

NOTE: Smear needle bearing rollers with petroleum jelly prior to assembly.

1. Measure and record thickness of original thrust washer.
2. Fit original thrust washer on shaft.
3. Fit needle bearing rollers in 1st gear.
4. Fit 1st gear on shaft.
5. Fit 1st/2nd synchro assembly.

CAUTION: Ensure reverse gear on synchro sleeve is adjacent to 1st gear.

6. Measure and record length of 2nd gear collar.
7. Fit 2nd gear collar on shaft ensuring lubrication groove is towards 1st/2nd synchro assembly.
8. Fit needle bearing rollers in 2nd gear.
9. Fit 2nd gear on shaft.
10. Fit 3rd and 4th gears ensuring that bosses on gears are adjacent to each other.
11. Fit 5th gear ensuring that large boss on gear is towards threaded portion of shaft.
12. Fit new output shaft bearings ensuring that snap ring groove in ball race is towards threaded portion of shaft.

CAUTION: Ensure that replacement bearings are the same as originally fitted. Where a roller bearing and single ballrace is to be fitted, the single ballrace must be adjacent to threaded portion of shaft.

13. Fit a new tongued washer with dished side of washer towards bearing.
15. Fit a new nut and tighten to 110 Nm.

NOTE: Nut has a LH thread; do not stake nut at this stage.
Output Shaft Gear End-Float - Check

6. Compare length of original collar and select a collar which will provide specified clearance. Collars are available in the following lengths: 28.99 mm and 29.04 mm

7. Having determined thickness of selective thrust washer and length of 2nd gear collar required, fit thrust washer and collar.

8. Secure output shaft nut by staking.

1. Using feeler gauges measure clearance between 1st gear and thrust washer. Standard = 0.03 to 0.08 mm Service limit = 0.18 mm

2. From clearance obtained, calculate thickness of thrust washer required to give correct clearance. If clearance obtained exceeds service limit, fit a thicker thrust washer; if it is less than 0.03 mm, fit a thinner thrust washer.

NOTE: Thrust washers are available as follows:
1.96 to 2.08 mm thick in increments of 0.03 mm

3. Select a thrust washer of the required thickness to bring end-float within limits.

4. Using feeler gauges measure clearance between 2nd and 3rd gears. 2nd/3rd gear clearance = 0.03 to 0.10 mm

5. If clearance exceeds figure given, it will be necessary to fit a shorter 2nd gear collar; if clearance is less than figure given, it will be necessary to fit a longer collar.
Input Shaft End thrust - Check and Adjust

1. Fit a new input shaft bearing in differential housing using tools 18G 1354 and 18G 1354-6.

   CAUTION: Do not fit oil seal at this stage.

2. Position input shaft assembly in differential housing ensuring it is fully inserted in bearing.

   NOTE: Position housing so that end of shaft is clear of bench.

3. Fit gear case, fit and tighten bolts to 45 Nm.

4. Position a straight edge and depth gauge across face of differential housing.

5. Pull input shaft into differential housing and position end of depth gauge on end of shaft; record measurement shown on gauge.

6. Push input shaft towards gearcase, record measurement shown on gauge.

7. Subtract thickness of straight edge from above readings.

8. Subtract first measurement from second measurement; record figure obtained. Call resultant measurement A.

9. Calculate thickness of circlip(s) required by subtracting 0.97 mm from dimension A. Input shaft end thrust = 0.14 to 0.21 mm
10. Select circlip(s) from sizes available which equal thickness required. Fourteen circlips are available ranging from 0.5 mm to 1.15 mm thick in increments of 0.05 mm.

**CAUTION:** No more than two circlips may be fitted. It is not always possible to select the exact thickness of circlips required; where this occurs, always fit a slightly thinner pack to avoid pre-loading bearings.

11. Remove bolts securing gear case; remove gear case.
12. Remove input shaft assembly.
13. Remove input shaft bearing from differential housing using a soft metal drift.

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### Differential Pinion Gear Backlash - Check and Adjust

1. Position differential assembly with bearings located in V blocks.
2. Fit both inboard drive shaft joints to align gears.
3. Assemble a DTI gauge with stylus of gauge contacting one of the planet gears; zero the gauge.
4. Measure and record planet gear backlash.
5. Repeat procedure for other planet gear.
6. Compare backlash figures obtained with the following:
   - Planet gear backlash = 0.05 to 0.15 mm
7. If backlash is not as specified, remove planet gears, measure thickness of original thrust washers and from figures obtained, calculate thickness of thrust washers required to give correct backlash.

**CAUTION:** Thrust washers selected must be of equal thickness, and are available from 0.70 to 0.90 mm thick in increments of 0.20 mm.

8. Fit selected thrust washers, secure pinion shaft with a new pin.
Standard and Torsen differentials:

9. Fit final drive gear to carrier ensuring reference marks are aligned.
10. Fit 10 bolts and tighten progressively to 110 Nm.

Differential Bearing Pre-load - Check and Adjust

1. Position original selective circlip in gear case.
2. Position differential assembly in differential housing.
3. Fit gear case, fit and tighten bolts to 45 Nm.
4. Lightly drive differential assembly into gear case to seat circlip.
5. Lightly drive differential into differential housing to settle bearing.

6. Using feeler gauges measure and record clearance between circlip and bearing outer face.
   Correct clearance = 0.15 mm maximum

7. If clearance is not as specified, select the appropriate circlip from the range available.

   NOTE: Circlips are available from 2.50 to 3.00 mm thick in increments of 0.10 mm.

8. Remove original circlip through oil seal aperture using tool 18G 1392.
10. Re-check bearing pre-load using above procedure.
11. Remove differential assembly, retain selected circlip.
GEARBOX ASSEMBLING

1. Lightly lubricate all components with gearbox oil.

2. Using a suitable piece of tubing, fit a new selector shaft oil seal.

3. Fit output shaft oil guide plate in differential housing.

4. Fit a new output shaft bearing in differential housing using tools 18G 1354 and 18G 1354-5.

5. Fit a new input shaft oil seal in differential housing using tools 18G 1354 and 18G 1354-4.

6. Fit input shaft bearing into differential housing using tools 18G 1354 and 18G 1354-6.

NOTE: Depending on application, output shaft bearing may have oil holes drilled in bearing cage; these holes must face towards output shaft when fitting bearing. Bearings without the oil hole may be fitted either way round.
CAUTION: Differential oil seals: Type A are fitted with early drive shafts. Type B oil seals are fitted to later drive shafts. The later oil seals are waxed and must be fitted dry. Ensure that replacement seals are the same type as those removed.

7. Fit a new differential oil seal in differential housing using tools 18G 1354 and 18G 1354-16.
8. Fit output shaft bearing retaining plate - if fitted.

CAUTION: Ensure side marked TOP is facing towards output shaft.

9. Fit 2 new Patchlock bolts to secure bearing retaining plate; tighten bolts to 8 Nm.
10. Fit selector shaft and selector shaft guide.
11. Fit and tighten dowel bolt to 28 Nm.
12. Fit detent ball, spring and cap bolt, tighten bolt to 22 Nm.
13. Position differential assembly into housing.

14. Fit seal protector, tool 18G 1269A to input shaft, or apply masking tape to splines to protect oil seal.
15. Place input and output shafts together and fit assembly in differential housing.

NOTE: Position housing so that when fitted, end of input shaft is clear of bench.

16. Remove tool 18G 1269A.
17. Ensure output shaft nut is staked.
18. Position gears in neutral.
19. Raise both shafts slightly and fit selector forks assembly ensuring forks are located in grooves in synchromesh sleeves.
20. Fit reverse idler gear, thrust washer and shaft.

NOTE: Largeboss on idler gear must be towards differential housing.

21. Fit reverse selector fork and bracket.
22. Fit and tighten retaining bolts.
23. Fit interlock assembly ensuring base of interlock locates in slot at lower end of 1st/2nd selector shaft.
24. Fit and tighten interlock retaining bolts.
25. Fit new differential oil seals in gear case.

NOTE: Type A oil seal - use 18G1354 and 18G 1354-16
Type B oil seal - use 18G 1354 and 18G 1354-21

26. Fit input shaft oil guide plate in gear case.
27. Fit a new Belleville washer and selected circlip(s).
28. Fit selected circlip(s).
29. Fit new output shaft circlip in gear case.
30. Fit selected circlip in differential bearing recess in gear case.
31. Apply a bead of RTV silicone sealant to mating face of gear case.

32. Position gear case over differential housing keeping gear case square to housing.
33. Lower gear case into position and at the same time, expand output shaft bearing circlip using tool 18G 1392.
34. Push gear case fully down on to differential housing.
35. Ensure circlip is fully seated in groove in output shaft bearing, raise output shaft and a click will be heard as circlip enters groove.
36. Fit and progressively tighten gear case bolts to 45 Nm.
37. Fit reverse idler shaft bolt and tighten to 67 Nm. Use a new washer.
38. Apply thread sealant to access plug, fit and tighten plug using tool 18G 1472.
39. Fit reverse light switch and new washer, tighten to 25 Nm.
40. Fit speedometer drive pinion and housing; use a new 'O' ring; fit retaining plate, fit and tighten bolt to 5 Nm.
41. Fit new clutch release shaft oil seal.
42. Fit clutch release shaft and fork.
43. Fit and tighten bolt to 29 Nm.
<table>
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<td>Reverse idler gear to selector fork clearance</td>
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<td>Selector fork prong width</td>
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<td>Selector fork groove to pin clearance:</td>
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<td>Service limit</td>
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MANUAL GEARBOX

1st gear to thrust washer clearance:
Standard ............................................ 0.03 to 0.08 mm
Service limit ........................................ 0.18 mm
2nd to 3rd gear clearance ......................... 0.03 to 0.10 mm
Input shaft end thrust ........................... 0.14 to 0.21 mm
Planet gear backlash ............................. 0.05 to 0.15 mm
Differential bearing to circlip clearance ...... 0.15 mm maximum

TORQUE SETTINGS

Final drive pinion nut ............................ 110 Nm
Differential housing to gearcase bolts .......... 45 Nm
Selector shaft guide to selector shaft bolt ....... 28 Nm
Cap bolts - detent balls and springs .......... 22 Nm
Reverse idler shaft bolt .......................... 67 Nm
Speedometer drive pinion retaining plate bolt .. 5 Nm
Reverse light switch ............................. 25 Nm
Clutch release shaft pivot bolt .................. 29 Nm
Final drive gear to carrier bolts ............... 110 Nm
Output shaft bearing retainer bolts - if fitted .. 8 Nm

TOOL NUMBERS

18G 2 ................................................. General purpose puller
18G 2/3 ............................................... Adapter - Differential bearing remover
18G 134 .............................................. Driver handle - main tool
18G 134-12 ........................................ Adapter - Type B differential oil seal replacer
18G 284 .............................................. Slide hammer
18G 284-14 ......................................... Adapter - Slide hammer
18G 1269A ........................................... Oil seal protector sleeve
18G 1354 ............................................. Driver handle (main tool)
18G 1354-4 ......................................... Input shaft oil seal replacer
18G 1354-5 ......................................... Bearing replacer
18G 1354-6 ......................................... Adapter - Input shaft differential bearing
18G 1354-16 ....................................... Adapter - Type A differential oil seal replacer
18G 1392 ............................................. Circlip pliers
18G 1397 ............................................. Bearing puller thrust pad
18G 1472 ............................................. 14 mm Hex key access plug
18G 1473 ............................................. Anti-spread plate
18G 1675 ............................................. Differential bearing replacer
18G 1723-1 ........................................ Clutch release shaft inner bush replacer
18G 1723-2 ........................................ Clutch release shaft outer bush replacer